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A HAND-OPERATED INSECT ASPIRATOR

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Mouth-operated insect aspirators have been used by entomologists for over a century, but they have not been entirely satisfactory because of health hazards, annoyance, and other objections. A hand-operated rubber-bulb aspirator currently available is often unsuitable because of inadequate suction.

Oman (8) calls attention to a desirable modification--namely, conversion of the aspirator to the blow type--but this is also mouth-operated. Wishart (10) describes several aspirators that require a power source or mouth suction. Barr (1) and others have used a modified running-water pump in the laboratory in place of mouth suction. Flanders (2), Garman and Brigham (3), and Hinds and Spencer (5) have described electric suction collectors, and Hill (4) a battery-operated portable collector that he devised for field use. Lindquist (6) developed a container with a finger-operated lid for removing insects from cages. Some of the numerous other modifications that have been developed by various workers for specific purposes are described by Peterson (9).

The hand-operated aspirator illustrated in figures I and II has been found satisfactory for many types of field and laboratory insect collecting. The thumb is placed on the plunger-depressing knob (1a) of the suction pump and the index and middle fingers beneath the finger grip (3a), which is an integral part of the plunger-cylinder sleeve (3). The plunger-cylinder sleeve is secured to the top bellows board (5). When the plunger (1) is inserted into the cylinder sleeve (3) with movement of the fingers, it depresses the bottom bellows board (7) to which it is attached, thus expanding the bellows (6). This depressing movement opens the lower bellows-board flutter valve (9), permitting air to be drawn from the tube (16), which connects the lower bellows-board orifice tube (8) to the collecting-bottle orifice tube (12), and also from the collecting bottle (11) into the opening bellows (6). This movement of air creates a partial vacuum in the collecting bottle, and the insect is sucked in through the receiving tube (15) with the inrushing air. A screen (13) prevents the insect from entering the bellows chamber. When the fingers are released, a compression spring (2) returns the

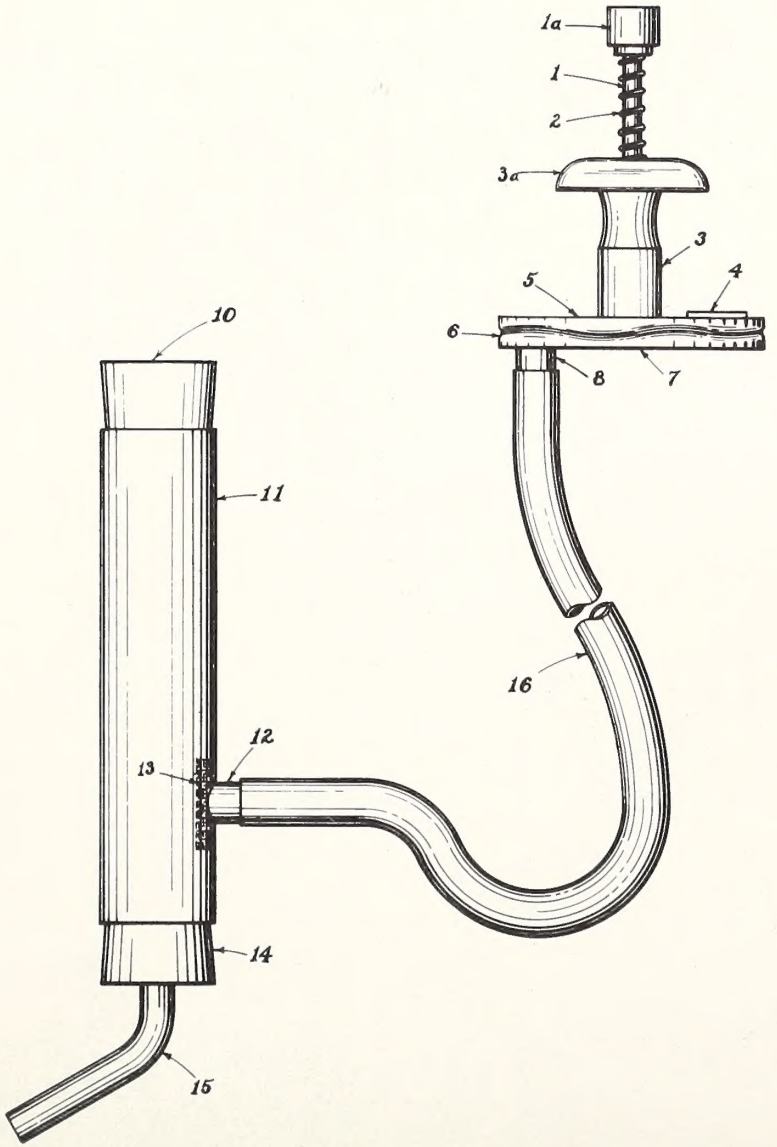

Figure I

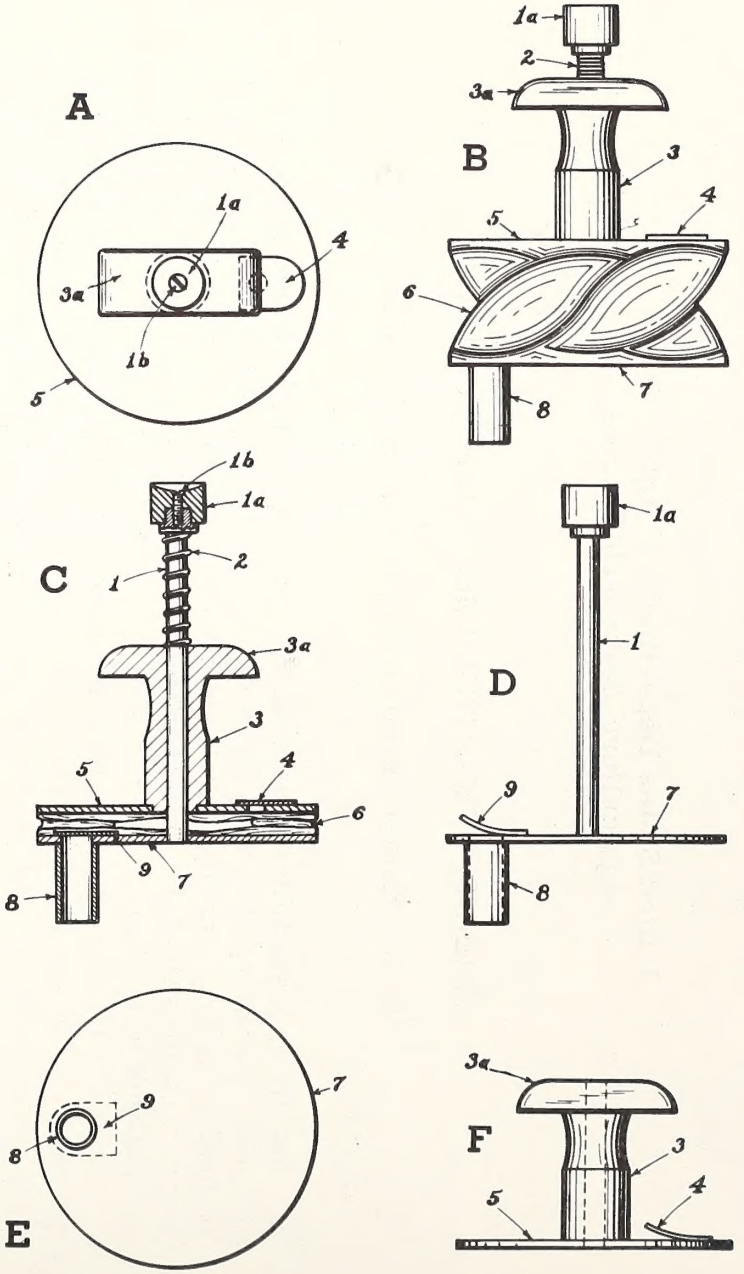

Figure II

plunger to its open position, and the flutter valve (4) on the upper bellows board is forced open, allowing air to escape from the closing bellows. The bellows folds return to their original alignment guided by the free-swiveling depression knob which is attached by a machine screw (1b). The receiving tube (15) is set in a rubber stopper (14), and there is also a stopper (10) at the top of the collecting bottle to facilitate removal of the insects.

The bellows boards, plunger, depression knob, plunger-cylinder sleeve, and collecting bottle may be fabricated of sheet and tubular plastic, and they can be joined with a suitable plastic cement. The flutter valves may be cut from thin rubberized sheeting and glued to the bellows boards. The suction pump is made of the two units D and F (fig. II), which are joined with the bellows. The bellows may be cut from bellows cloth, obtainable from organ sales and service establishments.

The aspirator depicted has bellows boards 3 1/2 inches in diameter, a plunger 3 1/2 inches long, flutter-valve orifices 3/8 inch in diameter, and a plunger-cylinder sleeve 2 inches long. The bellows open 1 1/4 inches, and this is also the distance from the top of the plunger-cylinder sleeve to the bottom of the depressing knob. The connecting tube is approximately 2 feet long and the collecting bottle is 7 inches long and 1 1/4 inches in diameter. Dimensions of the suction pump may be increased, and the size of the collecting bottle decreased for an even more powerful aspirator.

The bellows as described is manually operated; however, it may be modified by placing it beneath a foot treadle and thereby freeing one hand. Also the collecting bottle may be designed to contain cyanide as described by Metcalf (7). Insertion of the connecting tube into the stopper (10), drilled to receive it, will eliminate the need for the bottle-orifice tube.

Figure I.--Insect aspirator assembly, elevation view.

Figure II.--Details of suction pump: A, top view; B, C, D, F, elevation views (B, bellows open, C, bellows closed, cross-section, D, stripped of plunger-cylinder sleeve and top bellows board, F, stripped of bottom bellows board); and E, bottom view.

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